

diminished by a transverse magnetisation.—A. König and Fr. Richarz, a new method of determining the constant of gravitation.—Leo Arons, interference fringes in the spectrum. Fringes are observed to intrude; which the author eventually traces to the films between the two lenses of the achromatic telescopes.—Robert Weber, the electrical siren. An interesting apparatus producing tones in a receiving telephone by interrupting the circuit by a rotating cylinder having series of electric contacts around its periphery.

xxv. May.—Prof. L. Lorenz, determination of the electric resistance of mercury columns in absolute electro-magnetic measure. The result of the author's method is that the true value of the ohm is represented by a mercury column of 1 square millimetre section and 105.93 centimetres in length.—Franz Stenger, contributions to the electric conductivity of gases.—Hans Jahn, on the validity of Joule's law for electrolytes. The careful experiments establish the validity to a very close degree.—R. Lamprecht, on flexible conductors under magnetic influence. A mathematical discussion.—J. J. Balmer, note on the spectrum lines of hydrogen. The wave-lengths of twelve observed lines are found to agree with the formula $\lambda = N(m^2/m'^2 - 4)$, where N is a coefficient, and m and m' whole numbers. For hydrogen, $N = 3645 \times 10^{-8}$ cm.—Dr. Fr. Vogel, change of refraction in glass and calc-spar with temperature. The author finds, with Fizeau, a diminution in the difference between the two indices of calc-spar nearly proportional to the elevation of temperature.—Prof. W. Voigt, the optical properties of very thin metal films. Rediscusses Quincke's results.—Julius Elster and Hans Geitel, note on a sensitive Doubler. This is nothing else than a Thomson's water-dropper.—Elster and Geitel, remarks on the electric processes in storm-clouds. The authors regard thunder-clouds as acting as the water-dropping doubler does, in raising at the expense of the kinetic energy of the falling drops the electric potential of the mass placed under electric influence.—Elster and Geitel, on the development of electricity during formation of rain.—Dr. H. Kayser, on lightning photographs.—Prof. G. F. Fitzgerald, on the memoir of Prof. Kundt on the electromagnetic rotation of the plane of polarisation of light by iron, cobalt, and nickel.—Hanichi Muraoka, on the magic Japanese mirror.—K. Exner, remark on the velocity of light in quartz.

Rendiconti del Reale Istituto Lombardo, June 11.—Further remarks on the functions that satisfy the differential equation $\Delta^2 u = 0$, by Prof. Giulio Ascoli.—On the resolution of certain modular equations, a complement to the author's paper on the transformation and division of the elliptical functions, by G. Morera.—Inversion of the movement of the pupil in the case of a person affected by progressive analysis, by Prof. A. Raggi.—On certain physiological functions of the lower organisms: a contribution to the morphology of the Metazooi, by Prof. Leopoldo Maggi.—Reply to the recent objections advanced against a science of penal jurisprudence, by E. A. Buccellati.—Some recent studies on the origin of the Institutions of Justinian, by Prof. C. Ferrini.

THE largest space in the *Nuovo Giornale Botanico Italiano* for July is occupied by a paper by Sig. C. Massolongo, on the Hepaticæ gathered by Dr. Spegazzini in Terra del Fuego in 1882, an important contribution to Hepaticology. Ninety-five species are described, a considerable number of them new, including, also, one new genus, *Pisafettoa*. The paper is illustrated by no less than seventeen plates. The kindred Bryology claims also a paper by Sig. Venturi, on the Italian representatives of the section *Harpidium* of *Hypnum*. Sig. Piccone gives a list of marine and freshwater Algae observed by him on or near the Ligurian coast, many of them being new to the district. The only papers in this number not concerned with Cryptogamy are teratological—by Sig. Terracciano on a quadrilocular capsule of *Agave*; and by Prof. Caruel on Viridescence in *Verbascum*.

In the *Journal of Botany* for July, Mr. W. H. Beeby describes and figures the recently-discovered *Sparganium neglectum* from Surrey, for which he claims the rank of a good species. With the exception of a teratological note on *Peloria* in *Habenaria bifolia* by Mr. H. N. Ridley, all the other papers in this number are descriptive and topographical:—New ferns from Brazil, by J. G. Baker; additions to the British lichen-flora, by Rev. J. M. Crombie; Notes on the flora of Ceylon, by Dr. Trimen; on the flora of the Philippine Islands, by R. A. Rolfe; on Dovedale plants, by Rev. W. N. Purchas.—Dr. Buchanan White records one more addition to the Flowering plants of Great Britain, *Schemus ferrugineus*, from Perthshire.

SOCIETIES AND ACADEMIES

LONDON

Geological Society, June 24.—Prof. T. G. Bonney, F.R.S., President, in the chair.—John MacDonald Cameron, Matthew Heckels, and Robert H. Williams, were elected Fellows of the Society.—The following communications were read:—Supplementary notes on the deep boring at Richmond, Surrey, by Prof. John W. Judd, F.R.S., Sec.G.S., and Collett Homersham, F.G.S. Since the author's former communication to the Society on the subject, this boring, in spite of the strenuous efforts made by the Richmond Vestry, and the contractors, Messrs. Docwra and Co., has had to be abandoned, after reaching a total depth of 1447 feet from the surface. This depth is 145 feet greater than that of any other well in the London Basin, and, reckoning from Ordnance datum, reaches a lower level by 312 feet than any other well in the district. Before the termination of the work temperature-observations were obtained, which generally confirm those previously arrived at. The strata in which the boring terminated consisted of the red and variegated sandstones and marls previously described, which were proved to the depth of 208 feet. Although it was demonstrated that these beds have a dip of about 30°, complicated in places by much false-bedding, no conclusive evidence could be obtained concerning their geological age. They may be referred either to some part of the Poikilitic series, or to the Carboniferous (for similar strata have been found intercalated in the Carboniferous series at Gayton, near Northampton), or they may be regarded as of Old Red Sandstone age. Some interesting additional observations have been made since the reading of the former paper, on the Cretaceous rocks passed through in this well. Mr. W. Hill, F.G.S., of Hitchin, has found the exact analogue of the curious conglomerated chalk met with at a depth of 704 feet at Richmond. His observations entirely confirm the conclusion that we have at this depth the "Melbourne rock" with the zone of *Belemnites plenus* in a *remanie* condition at its base. Some new facts concerning the state of preservation of the fossils in the Chalk Marl are also recorded. With respect to the conclusions arrived at by the author concerning the distribution of the Jurassic rocks on the south side of the London Basin, an important piece of confirmatory evidence has been supplied by a deep boring made at the Dockyard-Extension Works at Chatham. This section, for the details of which the authors are indebted to the officers of the Geological Survey, shows that under the Chalk and Gault, with normal characters and thickness, there lie 41 feet of sandy strata of Neocomian age, and that these are directly underlain by blue clays of Middle Oxfordian age, as is proved by the numerous fossils which they have yielded. We have now, therefore, direct evidence of the existence and position of strata of Lower, Middle, and Upper Oolite age, respectively, beneath the Cretaceous rocks of the south-east of England.—On the igneous and associated rocks of the Breidden Hills in East Montgomeryshire and West Shropshire, by W. W. Watts, F.G.S. The author, in this paper, described the succession of rocks in the small tract near the Breidden Hills situated between Welshpool and Shrewsbury. The Cambrian rocks are: (1) Criggion shales, dark and barren, much penetrated by intrusive diabases and about 2700 feet thick. (2) Andesitic lavas and ashes, followed by conglomerates of the same materials. (3) Ashy grits and shales containing *Climacograpsus antiquus*? *C. bicornis*? *C. scharenbergi*, *Cryptograpsus tricornis*, *Diplograpsus foliaceus*, *Leptograpsus flaccidus*? *Beyrichia complicata*, *Trinucleus concentricus*, *Orthis testudinaria*, *Bellerophon bilobatus*. The rocks are thus of Bala age, the fossils indicating that the ashy grits and shales are on the horizon of the top of the Glenkiln or bottom of the Hartfell series. These are followed by Silurian strata. (1) *Pentamerus* beds. Soft sandstones and mudstones yielding *Pentamerus globosus*? *P. oblongus*, *P. undatus*, *Leptaena transversalis*, *Strophomena rhomboidalis*, *Petraia subduplicata*. (2) purple shales, unfossiliferous. (3) Lower Wenlock shale, with *Monograptus vomerinus*? *Cryptograpsus*, sp., *M. priodon*, var. *Flemingi*. These graduate into (4) Upper Wenlock shale, with *M. priodon*, *M. vomerinus*? *M. basilicus*, *M. nilssoni*, *M. romeri*. (5) Lower Ludlow shale. *M. colonus*, *M. nilssoni*, *M. salweyi*, *M. lantauardensis*. The paper concluded with microscopical descriptions of the igneous rocks, of which there are two sets: (1) An older set interbedded with the Cambrian and consisting of andesites bearing a large percentage of a mineral allied to enstatite, together with augite and a small quantity of hornblende and mica. These are

chiefly lavas, but some few are perhaps intrusive rocks and dykes. (2) Intrusive rocks of a diabase type, generally, however, containing a variety of enstatites identical with that in the andesites. These are intrusive in the Cambrian rocks, and from their relations appear to be most probably of post-Silurian age.—Note on the Zoological position of the genus *Microcharus*, Wood, and its apparent identity with *Hyopodus*, Leidy, by R. Lydekker, B.A., F.G.S.—Observations on some imperfectly known Madreporaria from the Cretaceous formation of England, by R. F. Tomes, F.G.S.—Correlations of the "Curiosity-Shop" beds, Canterbury, New Zealand, by Capt. F. W. Hutton, F.G.S. The "Curiosity Shop" is a locality on the River Rakai in the Canterbury Plains, and has been thus named on account of the numerous fossils found in some calcareous sandstones cut through by the river. The section exposed consists of (1) river-gravels; (2) loose grey quartz sands; (3) soft calcareous sandstone with glauconite, passing downwards into tuffaceous clay; (4) calcareous sandstone without glauconite; (5) loose grey or yellowish brown sands. By Mr. McKay, of the Geological Survey, No. 2 had been referred to the Pareora series (Miocene?), No. 3 to the Upper Eocene series, and Nos. 4 and 5 to the Cretaceous-Tertiary series. The author, who was inclined to class all these beds in a single series, pointed out that the only difference between the fossils found in Nos 3 and 4, the most important fossiliferous beds, consisted in the presence of a greater number of forms in No. 3, all found in No. 4 being identical with those in the overlying bed. He then gave a complete list of the species of Vertebrata, Mollusca, Brachiopoda, Echinodermata, Bryozoa, and Coelenterata, from the locality, 48 in all, and compared them with those from the Weka Pass stone, 26 in number, and the Otara fossils from Oamaru, to show that a large proportion were identical. He gave reasons for not agreeing with the views of Dr. Hestor and Mr. McKay, who held that unconformity exists between the beds referred by them at the Curiosity Shop, in the Weka Pass district, and north of Otago, to the Upper Eocene and Cretaceous-Tertiary series respectively, and showed, both from palæontological and stratigraphical data, that all these rocks must be included in one system, the Oamaru system of Dr. von Haast and himself.—On the fossil flora of Sagor in Carniola, by Constantin, Baron von Ettingshausen, F.C.G.S. The author in this paper gave the principal results of his examination of the fossil flora of Sagor, consisting of 170 genera and 387 species, of which a list was appended. The plants were obtained from fourteen different localities, some of the most important species from each of which were mentioned; in one of these localities the flora underlying the brown coal of the district belonged to the uppermost Eocene, whilst the remaining stations were assigned to the lowest stage of the Miocene system. The great diversity of the fossil plants showed that the Tertiary flora of this and other localities must be considered the origin of all the living floras of the globe; for in the fossil flora of Sagor are found plants representative of forms now found in Australia, North America, and Mexico, California, Chili, India and the East Indian Islands, Europe, Africa, Norfolk Island, and New Zealand. Examples of all these were cited.

EDINBURGH

Royal Society, July 6.—Sheriff Forbes Irvine, Vice-President, in the chair.—Dr. R. W. Felkin, F.R.G.S., gave an account of the For tribe, one of the Negro races of Central Africa.—The Astronomer-Royal for Scotland communicated a paper, by Dr. Daniel Draper, on bisulphide of carbon prisms, and also exhibited some stereoscopic photographs.—Drs. Woodhead and Hare, in a paper on the vital relations of micro-organisms to tissue-elements, endeavoured to classify as far as possible the actions of micro-organisms on tissues. They pointed out that the reaction of the tissue-elements themselves had latterly been too much lost sight of, and that a more careful study of the normal cell-life history must in time be the means of throwing considerable light on the subject under discussion. They insisted very strongly on the digestive action of micro-organisms.—Thomas Andrews, F.C.S., submitted a paper on the resistance, during recrystallisation, of fused salts of the halogens, compared with some others and glass.—Prof. Turner gave an account of a specimen of Sowerby's whale (*Mesoplodon bidens*), recently obtained from Shetland, calling special attention to the great complexity of the stomach, the contents of which seemed to indicate that the animal fed upon fish.—Mr. W. E. Hoyle laid before the meeting the second part of the Preliminary Report on the *Challenger* Cephalopoda.

PARIS

Academy of Sciences, July 20.—M. Bouley, President, in the chair.—Observations of the small planets made with the large meridian at the Observatory of Paris during the first quarter of the year 1885, communicated by M. Lewy.—Note on the movement of rotation of the earth around its centre of gravity, by M. Tisserand.—On various propositions relating to the movement of a solid body around a fixed point, by M. G. Darboux.—A spectroscopic study of substances rendered phosphorescent by the action of light or by electric discharges, by M. Edm. Becquerel.—On the metaphosphate of thorium, by M. L. Troost. This substance, obtained by the reaction of the chloride of anhydrous thorium on an excess of metaphosphoric acid in solution, takes the form of crystals insoluble in water and easily separated from metaphosphoric acid. Its analysis yielded metaphosphoric acid 52.45; thorine 47.64.—Researches on the duration of excitability in the excito-motor regions of the brain proper after death, by M. Vulpian.—Observations on the fauna of the island of Great Comoro, to the north-west of Madagascar, by MM. Milne-Edwards and E. Oustalet. From a careful study of the mammals and birds of this island the authors conclude that it is not a geographical dependence on Madagascar, that it never was attached to that region, and that its fauna has borrowed from the surrounding lands.—Note on the intermediary orbit of the moon, by M. Hugo Gylden.—On the vaso-motor action of suggestion on hysterical subjects in a state of somnambulism, by M. Dumontpallier. From experiments made on two women subject to hysteria in the hospital de la Pitié it appears that, under certain conditions, suggestion may produce a vaso-motor modification characterised by a considerable increase of temperature in any region determined at pleasure. This result opens the way to a series of fresh experiments of the same order, and renders possible a physiological interpretation of phenomena, the reality of which science had hitherto regarded as somewhat doubtful.—Observations of Barnard's new comet made at the Observatory of Nice (Gautier's equatorial), by M. Charlois.—On the sixteen systems of planes of the regular convex icosahedron, by M. E. Héward.—On the capillary constants of the saline solutions, by M. A. Chervet.—Note on the production of the lowest temperatures, by M. K. Olszewski.—Experiments on the regulation of the charges and discharges in electric accumulators, by MM. Crova and Garbe.—Note on the electric resistance of alcohol, by M. G. Fousseau.—Heats of formation for some phthalates, by M. Colson.—Remarks on some phenomena of oxidation and reduction produced by the microscopic organisms of the soil, by M. A. Müntz.—On the variation of the physical properties in the series of chloro-acetic derived substances, by M. L. Henry.—On the existence of glycogene in the yeast of beer, by M. Léo Errera.—On the existence of a nervous system and of an organ of sense in *Rhabdovates aculeis*, *Convolutula Schultzii*, and other members of the same group, by M. Yves Delage.—Note on the analytical and comparative morphology of the mandible in the hymenoptera, by M. Joannes Chatin.—The Coregoni of the Swiss lakes (*C. dispersus*, *C. ballens*, &c); their marine origin, classification, reproductive processes and gradual adaptation to their changed surroundings, by M. V. Tatis.—Note on the tertiary basin of Grenada, by MM. M. Bertrand and W. Kilian.—A contribution to the study of antiseptics; action of the antiseptics on the higher organisms (continued); phenic acid and resorcin, by MM. A. Mairat, Pilatte and Combemale.—Experiments made on the body of a criminal recently guillotined at Troyes, by MM. P. Regnard and P. Loye. These experiments mainly confirm those already observed on animals, and tend to reassure those who suspect the persistence of conscious life after decapitation.—Observations on the foregoing experiments, by M. Paul Bert.—On the photographic determination of the trajectory of a point in the human body during the movements of locomotion, by M. J. L. Soret.—Note on the theory of the perception of colours, by M. Aug. Charpentier.—A formal denial of the reports regarding the appearance of cholera in Hérault was made by M. Colson on the authority of a letter from Dr. Boissier, local medical inspector.

BERLIN

Physical Society, June 12.—Dr. Lummer communicated his further observations on the interference-phenomena produced by glasses parallel to the same plane. If monochromatic light fell from a luminous surface on a glass plate of moderate thickness, differences of phase arose by reflection on the anterior and

posterior surface, in the beams of light falling under different angles. These differences of phase, as the speaker demonstrated by showing the course of the single bundles of rays produced on the retina of an eye focussed for parallel rays, a system of coloured and dark concentric rings, similar to Newton's rings of colour. This system of rings appeared, however, only when the plates were exactly parallel, at least to as great a degree of precision as that of the rays which enter the pupillary aperture by reflection from any point. These rings might therefore be utilised as a test of the parallelism of the glasses. Deviations of 0.2 wave-length caused no disturbance in the rings, but differences in the thickness of the glass amounting to 0.5 λ certainly gave rise to such disturbance. Bringing the glass before the eye, which was always accommodated to infinitude, considerably large spaces of the glass might be tested in reference to their parallelism. Any thinning or any thickening of the glass would be at once marked by displacements in the ring-systems and their wandering from the interior to the outside, or from the outside to the interior. The speaker compared his method of observing the interference phenomena, and testing the parallelism of the glass surfaces with that of Pizeau, and brought out the differences of the two, as also the advantages of his method.—Dr. Kayser gave a report of two works quite recently published on spectrum analysis, which seemed to make an important advance in the theory of spectral lines. It had formerly been attempted in vain to find harmonic relations, such as those existing among the upper tones of a sounding body, among the lines shown by the spectrum of a metal vapour, but the attempt to find such simple relations was abandoned after the question had been discussed by Prof. Schuster. Lately, however, Herr Balmer, in calculating the wave-lengths of the hydrogen lines, as given by Angström, had found a relation between these lines, expressed by the formula $\lambda = \frac{m^2}{m^2 - 4} \cdot C$, when C had the value

of 3645.6 millionths of a millimetre. In place of m let there be put in turn the numbers 3, 4, 5, 6, then were obtained Angström's undulatory lengths of the four visible hydrogen lines. If the calculation were carried still further, and for m were placed the values 7, 8, &c., on to 16, then were obtained values for hydrogen lines which coincided very well with the wave-lengths of the lines which Dr. Huggins had found in the ultra-violet spectrum of the white stars, and had recognised as the invisible hydrogen lines. The longest among these ultra-violet hydrogen lines had been photographed by Prof. Vogel in the spectrum of a glowing hydrogen tube. This relation between the hydrogen lines had now received an increased significance from an investigation by Prof. Cornu, in which he had found a perfectly determinate proportionality in the lines of the ultra-violet spectrum of aluminium and of thallium to the ultra-violet hydrogen lines. Like the hydrogen lines, the pairs of lines of the two metals referred to advanced so much nearer to one another, and became so much paler the more one approached the more refrangible end of the spectrum; and if any line of the aluminium or the thallium spectrum was made to coincide with the corresponding line of the hydrogen, then did all the remaining lines coincide. This relation obtained both for the first and for the second lines of the pairs of lines in the metal spectra.—Prof. von Helmholtz drew the attention of the Society to an investigation of Dr. Wernicke, which will shortly be published, of great importance for the theory of the reflection of light. The experiments had reference to the reflection of thin plates in which each ray divided into two, one being reflected, the other refracted and again reflected by the posterior surface, in addition, still further secondary refractions and reflections came into account. The difference of phase in the reflected rays, on monochromatic light being applied, was observed through their interference phenomena. According to the theoretical development given by Dr. Wernicke, without any hypothetical assumption whatsoever, the difference of phase depended on the sine of the angle of incidence, on the cosine of the angle of refraction, and on three constants. By examining a large series of solid bodies—transparent crystals as well as metal films—Dr. Wernicke found in the case of incidences which were approximate to the angle of polarisation that, if the plane of polarisation were parallel to the plane of incidence, the three constants became zero. If, on the other hand, the plane of polarisation was perpendicular to the plane of incidence, the constants had a definite value. This experimental result was in agreement with Fresnel's theory of reflection. According to Naumann's theory the constants must become zero in the case of perpendicular polarisation planes and have a

definite value in case of parallel direction. According to Ketteler's theory the constants could never become zero.

STOCKHOLM

Academy of Sciences, June 10.—The following papers were presented for insertion in the *Transactions* of the Academy: Contributions to the physiological anatomy of the algæ, by Herr N. Wille.—On Japanese cephalopoda, by Herr A. Appellöf, B.A.—On the determination of the amount of electromotive power of the voltaic arc, by Prof. E. Edlund.—Contribution to the question of the action of fluidity upon the electric conducting power of electrolytes, by Dr. S. Arrhenius.—Researches on the electric spark in fluids, by Dr. C. A. Möbius.—On the conformation of the hypostoma in some Scandinavian Asaphids, by Prof. W. Brögger.—On an *Inoceramus* from Queensland, by Prof. B. Lundgren.—A catalogue of the Silurian crustacea of Gothland, I. Trilobites and Merostoma, by Prof. G. Lindström.—On intermediate orbits, which at a given moment with a contact of the third order, join with the real orbits, by Prof. Gylden.—On alcohol in beer, by Prof. Hamberg.—On marine vertebrates from the northernmost part of the province of Tromsö and West Finmark, by Dr. C. Aurivillius.—On rhodonite from Fajsberg and Langbau, by Hen. G. Flink.—On the crystallographic constituents of godolinite, by Hen. F. Eichstedt.—Crystallographic researches on the rarer metals, by Hen. C. Morton.—On some combinations derived from dicyanophenylhydracin, by Dr. J. J. A. Bladén.—On melanism and combinations of melam, by Dr. P. Claesson.—Some speculations and experiments on filtration in its bearing upon the processes of transudation in the animal body, by Drs. R. Tigerstedt and C. G. Santesson.—Prof. Smitt reported on the International Ornithological Congress in Vienna of last year.—Prof. Wittrock exhibited the first fasciculus of the fodder-herbs of Sweden, edited by Drs. Jönsson and Whalsted, and gave an account of a report on a botanical expedition to Norrland and Norway, for the purpose of studying the morphology and phylogeny of the Hierarsia, by D. S. Almquist.

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